1,039,162

PATENT SPECIFICATION 1,039,162

DRAWINGS ATTACHED.

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COMPLETE SPECIFICATION.

Improvements in or relating to Thermostatic Mixing Valve.

We, AKTIENGESELLSCHAFT KARRER, WEBER & CIE, ARMATURENFABRIK UND METALLGIESSEREI, a Body Corporate organized under the laws of Switzerland, of Unterkulm, Aargau, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a thermostatic mixing valve for intermixing hot water and cold water to a predetermined mixing temperature, comprising a hot water chamber and a cold water chamber which are connected to a mixed water chamber through a hot water flow control valve and a cold water flow control valve respectively, each of said valves comprising a valve seating provided with flow ports and a movable valve member controlling the flow through the ports, the movable members being connected to a temperature responsive actuator and being adjustable relative to the actuator to provide the predetermined mixing temperature, the temperature responsive actuator being wholly housed in the mixed water chamber.

With mixing valves of this type it has been found to represent a disadvantage that for any adjustment of said hot and cold water flow control valves the mixed water chamber permanently communicates with the hot and/or cold water supply duct.

An object of the present invention is the provision of a mixing valve which avoids this disadvantage and, to this end, according to the invention the mixing valve is provided with additional valve closure members which cooperate with said flow ports of the valve seatings, these additional valve closure members being operable simultaneously and in the same sense by means of a handle for the purpose of opening and closing the control openings independently of the temperature actuated movable valve members of said hot and cold water flow control valves.

The temperature actuated movable members of the hot and cold water flow control valves are formed for example as two rigidly interconnected coaxial plungers which are axially movable within a rotatable cylinder sleeve forming the valve seats, provided with axially spaced flow ports, two sliding sleeves, forming the addtional valve members, being arranged on said rotatable sleeve for opposite movement relatively to each other towards and away from a transverse wall situated between said axially spaced flow ports, for covering or uncovering said ports.

The mixing valve structure according to the invention, comprising additional valve closure members cooperating with the flow ports of the hot and cold water flow control valves, enables the mixing chamber of the valve to be relieved of the pressure in the supply conduits when the outlet from the mixing chamber is closed, without necessitating any change in the adjustment of the hot and cold water flow control valves.

In order that the present invention may be more readily understood, an embodiment thereof will now be described with reference to the accompanying drawings, in which:—

Figure 1 is an axial section through the valve part containing the hot and cold water flow control valves, and

Figure 2 is a view in elevation, partly drawn in section, of the valve member in Figure 1, which is provided with the flow ports.

The mixing valve shown in Figure 1 comprises a cylindrical housing 1 with a cold water connection 2 and a hot water connection 3 which open into the interior of the housing 1 at one end of the housing. A

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mixed water chamber 5 is provided within a cylindrical insert member 4 in the middle section of the housing, shown in part only, and a temperature responsive element having an expansible body, not shown, and a feeler tube 6 are arranged in conventional manner within the chamber 5. An outlet pipe (not shown) is connected to the mixed water chamber 5, an independently-operable discharge valve for regulating the flow of water from the chamber 5 being arranged in said outlet pipe. From the expansible body a push rod 7 axially extends into the end portion of the housing, and carries a double plunger 8*a*, 8*b*. The plunger portion 8*b* facing the mixed water chamber 5 is provided with axially parallel passages 9. The edges of the opposite ends of the plunger portions 8*a*, 8*b* facing each other are axially spaced and respectively form the control edges of a cold water flow control valve and a hot water flow control valve. The double body-plunger slide 8*a*, 8*b* operates within a cylinder sleeve 10 which is provided with two rows of control slots 11*a*, 11*b*. The control edge of the plunger 8*a* cooperates with the slots 11*a*, while the control edge of the plunger 8*b* coacts with the slots 11*b*. The web of the sleeve 10 remaining between the slots 11*a*, 11*b* abuts against the inner face of an annular flange 12*a* of a sleeve 12 fixed within the housing 1; an O-ring 13 arranged in the annular flange 12*a* seals on both sides the web of the sleeve 10 which is rotatable with respect of the annular flange 12*a*. Outside of the sleeve 10 on both sides of the annular flange 12*a*, annular chambers 14 and 15, respectively, are formed. The annular chamber 14 forms the cold water chamber and is joined to the cold water connection 2, while the annular chamber 15 forms the hot water chamber which communicates with the hot water connection 3. The outer axially extending limits of the cold-water chamber 14 are formed by a slider sleeve 16 which is mounted upon the sleeve 10 so as to be axially movable and which is provided with an external threaded portion meshing with an internal thread of the sleeve 12. Sealing rings are provided between the slider sleeve 16 and the sleeve 12 and between the sleeve 16 and the sleeve 10. An O-ring 17 is inserted into the end face of the slider sleeve 16, facing the annular flange 12 and seals the cold water chamber 14 relatively to the cold water connection 2 in the closure position of the slider sleeve 16. The inner edge of this end face of the sleeve 16 is formed as control edge and cooperates with the slots 11*a* of the inner sleeve 10. The left hand terminal portion of the sleeve 16 remote from the cold water chamber 14 is provided with axially extending internal gear teeth 18 which mesh with corresponding external teeth 19 of the sleeve 10; the two sleeves 10 and 16 are thus connected for rotation, but are axially movable relatively to each other. Driver projections 20 of a disc 21 engage recesses of the sliding sleeve 16, which are provided at the end thereof. The disc 21 is situated between the adjacent end of the sleeve 10 and a closure member 22 screwed into the housing 1, and is rotatably mounted in a tubular extension 22*a* of the closure member 22 by means of an outwardly extending pin 23. The end portion of the pin 23 is of square section and carries a knob 24 supported by a holder 25 which is mounted in the extension 22*a* of the cover member 22 so as to be rotatable but axially fixed. Set screws 26 are radially inserted into the driver projections 20 of the disc 21 and enter into a peripheral groove 27 of a terminal flange of the cylinder sleeve 10.

The outer axial limiting surface of the hot water chamber 15 is formed by a sliding sleeve 28 similar to the sliding sleeve 16, and the end of which facing the annular flange 12*a* contains an O-ring 29 destined to cooperate with the latter. The inner edge of this end face forms a control edge coacting with the slots 11*b* of the sleeve 10. Also this sliding sleeve 28 is connected by an external screw thread to an interior threaded section of the sleeve 12, and by means of an axially extending internal gear teeth 30 meshes with corresponding external gear teeth 31 of the sleeve 10. Two O-rings are sealing the slider sleeve 28 on the one hand against the sleeve 12 and on the other hand against the sleeve 10. The screw threads of the two sliding sleeves 16 and 28 are oppositely directed, so that when the two sleeves are rotated in the same direction, they will approach each other or move away from each other.

The operation of the described valve is as follows: Assuming the various parts are arranged in the position shown in Figure 1. The plunger 8*b* then closes the control openings 11*b* of the sleeve 10, so that hot water is not able to pass from the supply connection 3 through the hot water chamber 15 and into the mixed water chamber 5; on the other hand the plunger 8*a* opens control ports 11*a* of the sleeve 10, so that the cold water connection 2 communicates with the mixed water chamber 5 by means of the cold water chamber 14 and the inner space of the sleeve 10 and of the plunger 8*b*. In this position, of course, the two sliding sleeves 16, 28 are retracted from the annular flange 12*a* to such an extent that their control edges open the control ports of the sleeve 10. By means of a knob (not shown) which is provided on the right end of the housing 1, the double plunger 8*a*, 8*b* can be adjusted to a position that it permits the flow of cold and hot water in the required proportions corresponding to the desired water tempera-

ture, into the mixed water chamber 5 through the openings 11*a*, 11*b* of the cylinder sleeve. When the mixing valve, set for a predetermined water temperature, is to be shut off and simultaneously the mixed water chamber separated from the water supply connections 2, 3, then the knob 24 is turned in the corresponding direction of rotation (according to the direction of the screw threads of the members 16 and 28). Turning of the knob 24 causes a concurrent rotation of the pin 23, and of the disc 21, and by means of the drivers 20 the sliding sleeve 16 is also rotated so that it moves towards the annular flange 12*a* owing to the screw thread connection with the sleeve 12. Also the sleeve 10 is concurrently rotated owing to the engagement of the gear teeth 18, 19; this sleeve 10, however, is retained against axial displacement by the set screws 26 engaging into the peripheral groove 27 of the sleeve. The sleeve 16 therefore moves along the concurrently rotating sleeve 10 towards the annular flange 12*a* until the O-ring 17 abuts against the flange; in this position the control edge of the slider sleeve 16 closes the openings 11*a* of the sleeve 10. At the same time the rotating sleeve 10, owing to the meshing teeth 30, 31, has concurrently rotated the other sliding sleeve 28 and, owing to the oppositely directed screw threads, has shifted this sleeve 28 in opposite direction also towards the annular flange 12*a*, until the O-ring 29 abuts against the flange 12*a* and the sleeve 28 closes the openings 11*b* of the sleeve 10. The two sliding sleeves 16, 28 cooperating with the control openings of the cylinder sleeve 10 thus forestall the connection between the water connections 2, 3 on the one hand and the mixed water chamber on the other hand, independent of the particular position of the plungers 8*a*, 8*b* of the hot and cold water flow control valves. This interruption of the connection, i.e. the relief of the mixed chamber, especially from pressure in the cold water supply thus may be effected without actuating the double plunger of the hot and colt water flow control valves; by turning the rotary knob 24 in the opposite direction of rotation the sliding sleeves 16, 28 are again moved away from the annular flange 12*a* in opposite directions, while opening the flow ports 11*a*, 11*b* of the sleeve 10, and thereby the connection as determined by the plungers 8*a*, 8*b*, between the connection 2, 3 and the mixed water chamber 5 is reestablished.

WHAT WE CLAIM IS:—

1. A thermostatic mixing valve for intermixing hot water and cold water to a predetermined mixing temperature, comprising a hot water chamber and a cold water chamber which are connected to a mixed water chamber through a hot water flow control valve and a cold water flow control valve respectively, each of said valves comprising a valve seating provided with flow ports and a movable valve member controlling the flow through the ports, the movable members being connected to a temperature responsive actuator and being adjustable relative to the actuator to provide the predetermined mixing temperature, the temperature responsive actuator being wholly housed in the mixed water chamber, said mixing valve being provided with additional valve closure members which cooperate with said flow ports of the valve seatings, these additional valve closure members being operable simultaneously and in the sense by means of a handle for the purpose of opening and closing the control openings independently of the temperature actuated movable valve members of said hot and cold water flow control valves.

2. A thermostatic mixing valve according to claim 1, wherein the temperature actuated movable members of the hot and cold water flow control valves are two rigidly interconnected coaxial plungers which are axially movable within a rotatable cylinder sleeve, forming the valve seats, provided with axially spaced flow ports, two sliding sleeves, forming the additional valve members, being arranged on said rotatable sleeve for opposite movement relatively to each other towards and away from a transverse wall situated between said axially spaced flow ports, for covering or uncovering said ports.

3. A thermostatic mixing valve according to claim 2, wherein the sliding sleeves are rotatably connected with said cylinder sleeve and provided with opposite external screw threads engaging corresponding internal screw threads of a stationary housing insert sleeve.

4. A thermostatic mixing valve according to claim 3, wherein a rotatable disc is mounted at one end of the valve housing and provided with driver members engaging into recesses of the sliding sleeve adjacent to this end of the housing, said disc having an axial pin projecting from the housing and carrying a rotary knob, whereby turning of the rotary knob in one or the other direction results in to a corresponding rotation of said sliding sleeve which thus imparts rotation to the axially stationary cylinder sleeve and to the second sliding sleeve, and both sliding sleeve are simultaneously moved in opposite axial direction.

5. A thermostatic mixing valve constructed and adapted to operate substantially as hereinbefore described with reference to the accompanying drawings.

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1039162 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

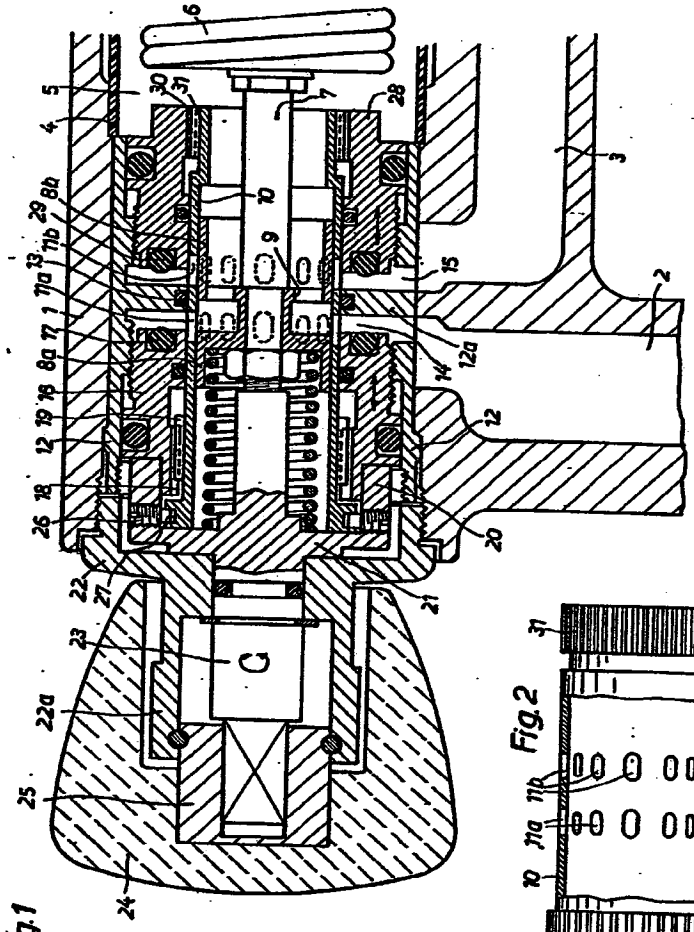

Fig.1

Fig.2